AURA Clouds and Aerosols and Climate Studies

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Outline

AURA cloud and aerosol data and climate studies

- **Process studies (improve understanding, then apply to climate studies)**
- **Add data to long-term climate records**

Examples

- **Aerosol-cloud interactions and**
- **Widening of the tropics**

Recommendations

Data of interest

Cloud top data (hPa)

OMI, HIRDLS

Cloud extinction profiles (km^{-1})

HIRDLS

Cloud Ice Water Content (g / m^3)

MLS

Aerosol data

OMI (Omar Torres' presentation)

MLS CO (aerosol proxy)

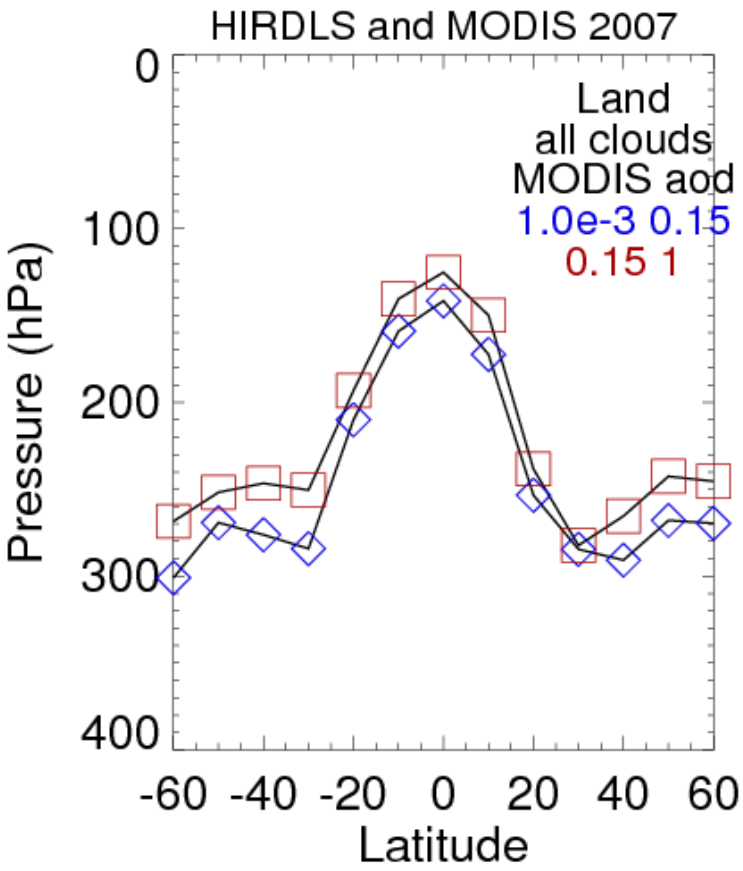
Cloud Top Data

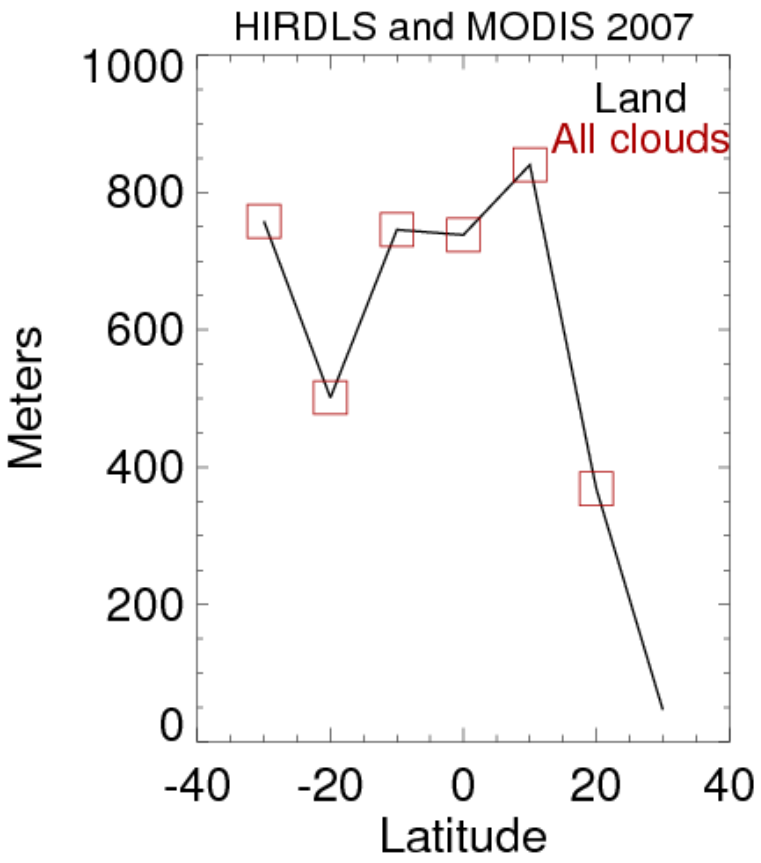
Process Study: Aerosol-cloud interaction

Add more aerosol (increase aerosol concentration)
Delay autoconversion rate of droplet formation
Alter latent heat release vertical profile
Invigorate cloud dynamics
Alter precipitation rates

Expect to see perturbations of cloud top altitudes

HIRDLS cloud top pressure versus MODIS aerosol

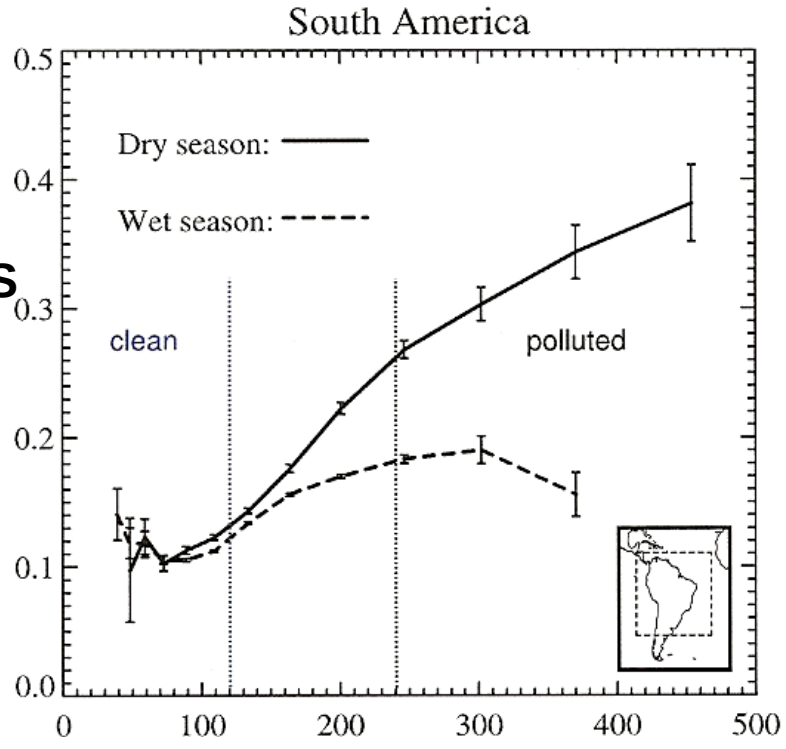




Two curves, P_1 and P_2
MODIS aerosol ranges:
0.001 – 0.15, 0.15 -1
Daytime observations

Average for 20 S to 20 N
Scale Height H = 6 km
Altitude shift dz = H alog(P_2/P_1)
dz ~ 600 m

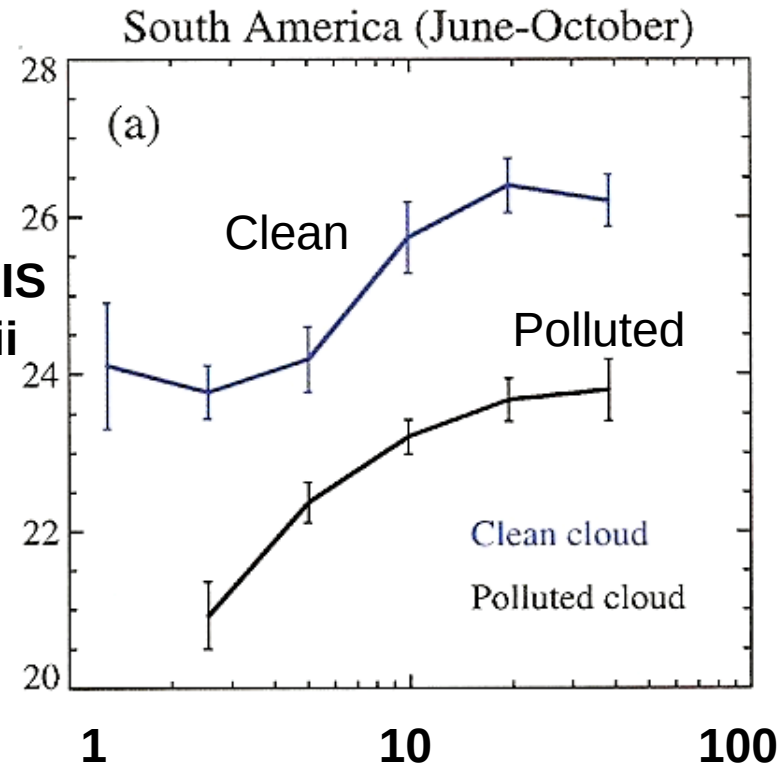
MLS CO at 215 hPa (aerosol proxy)



MODIS AOD

MLS CO (ppbv)

Dry Season



MODIS radii

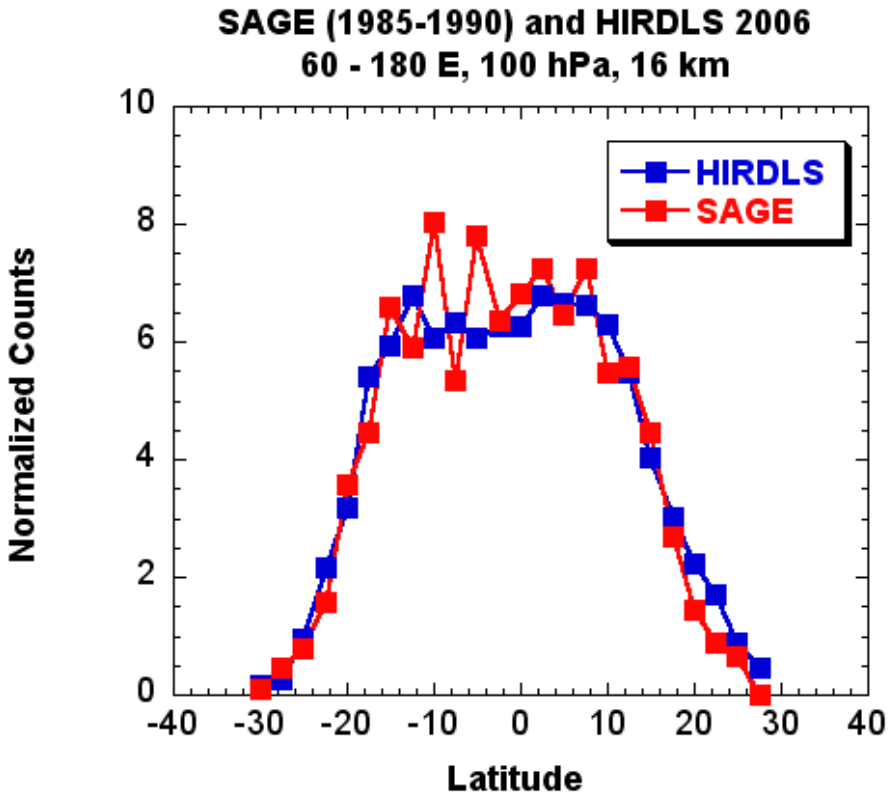
IWC (dynamics proxy)

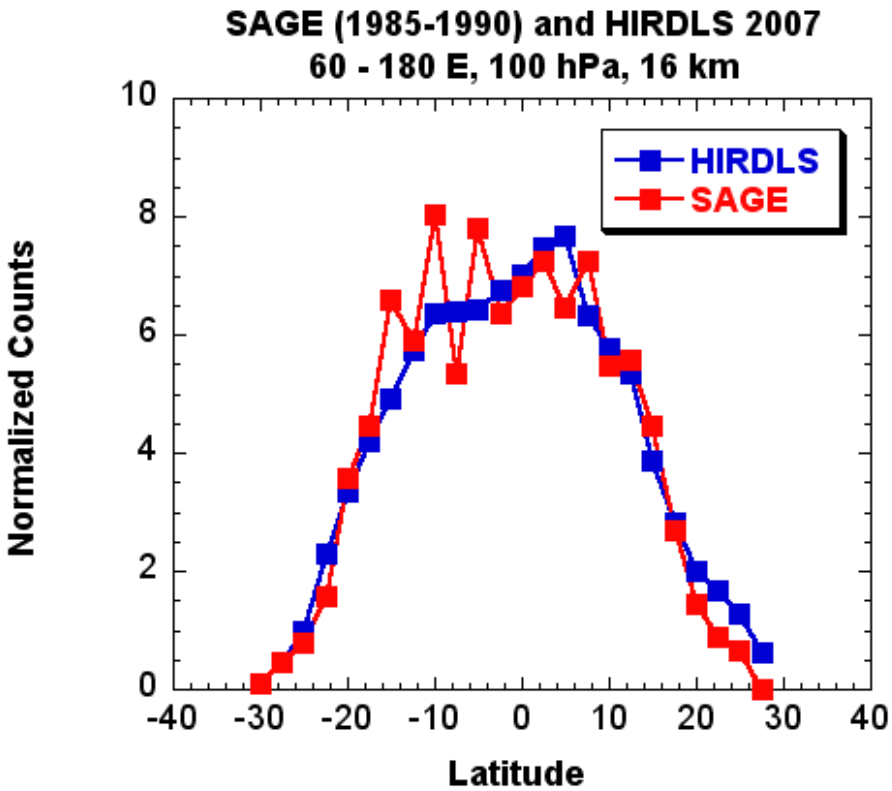
AOD = aerosol optical depth
IWC = ice water content

Jiang et al, GRL, v35, 2008

Seidel and Randel, Recent widening of the Tropical belt: Evidence from tropopause observations, JGR, v112, D20113, 2007.

Tropical belt has widened 3° latitude per decade





Little change in cirrus range during 20 year time period

Conclusions

NCAR

Climate trends and physical effects are small

- Tropics widen: 3° latitude per decade (literature)
- Cloud top heights are likely perturbed by aerosol
  - ~1/2 km

Process studies

- Aerosol-cloud interactions: intricate
- Dynamics versus microphysics
  - Need for vertical motion field measurements
- Many fields are of importance:
  - Will future capability be as complete as current A-train capability?